# C1-2 transarticular facet screws

May be used as an adjunct to posterior C1-2 wiring and bone graft – e.g. Interspinous fusion technique of Dickman and Sonntag – to achieve immediate stabilization without the need for postoperative external orthosis, or in cases where the posterior arch of C1 is fractured or absent. A major risk of the procedure is vertebral artery injury. Therefore many practitioners have adopted C1-2 lateral mass screws.

### **Selection of candidates**

May be appropriate in elderly patients or those with rheumatoid arthritis, in whom there may be slow fusion, or for those who have failed a previous attempt at C1–2 wiring/fusion. Also in young individuals who have ligamentous laxity.

All patients must have thin cut CT scans from the occipital condyles through C3 with sagittal reconstruction through the C1-2 facet on both sides to look for the presence of a vertebral artery in the intended path of the screw. Also, risk of VA injury can be reduced using CT scans reconstructed along the planned trajectory of the screw (aiming from a point 4 mm above the inferior C2 facet to a point in the anterior C1 button on CT).

#### **Technique summary**

A number of instrumentation sets are available for the procedure, and each has its own nuances. The following is intended to primarily cover the basic procedure common to most or all

### Position

Patient with the head clamped in a Mayfield head-holder with a slight military tuck of the chin. Lateral C-arm fluoroscopy is used for the procedure, and some have advocated biplane fluoro.

## Approach

Utilize a standard midline posterior laminectomy approach from occiput to the C3 spinous process. The lamina of C2 and the posterior arch of C1 are exposed to the lateral aspect of the C2 inferior articular facet. The lateral extent of the spinal canal is defined using a small angled curette. The C1-2 facet is curetted to facilitate arthrodesis and permits observation of the drill as it crosses the joint.

ENTRY 1-2 mm superior to the C2-3 facet on the midline axis of the pars interarticularis. The trajectory is determined fluoroscopically using a K-wire placed on the side of the neck as a guide, aiming it through the C2 inferior articular process, pars interarticularis, superior articular process and across the C1-2 articulation into the lateral mass of C1. This helps establish the appropriate entry site for the drill guide through a separate stab wound, usually around the T1-2 level, 2-3 cm o the

#### midline.

TRAJApilot hole is then drilled using visual guidance to maintain a straight parasagittal course (it helps to stand on 1 or 2 footstools to eliminate some of the parallax error) and fluoroscopic guidance to maintain the trajectory towards the C1 lateral mass. An assistant can reduce any atlanto-axial translational malalignment using a towel clip on C1 or C2 just prior to the drill crossing the C1–2 facet joint. To minimize the risk of VA injury, keep the drill as far dorsally as possible within the pars interarticularis. The pilot hole is then tapped and a fully threaded titanium screw is placed. If brisk arterial bleeding (not bone bleeding) occurs after drilling or tapping the first side, the VA may have been injured. The screw may still be placed but the contralateral hole and screw should not be placed. A post-op arteriogram is then performed to assess for propagating thrombus or dissection. Barring any contraindications, the procedure is repeated on the contralateral side. After screw placement, then posterior bone fusion – e.g. Interspinous fusion technique of Dickman and Sonntag – is performed.

External immobilization is usually not employed post-op (the screws are considered to supply adequate internal immobilization).

#### Results

A fusion rate of up to 99% with no complications has been reported. Injury to the vertebral artery is the main potential complication.

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